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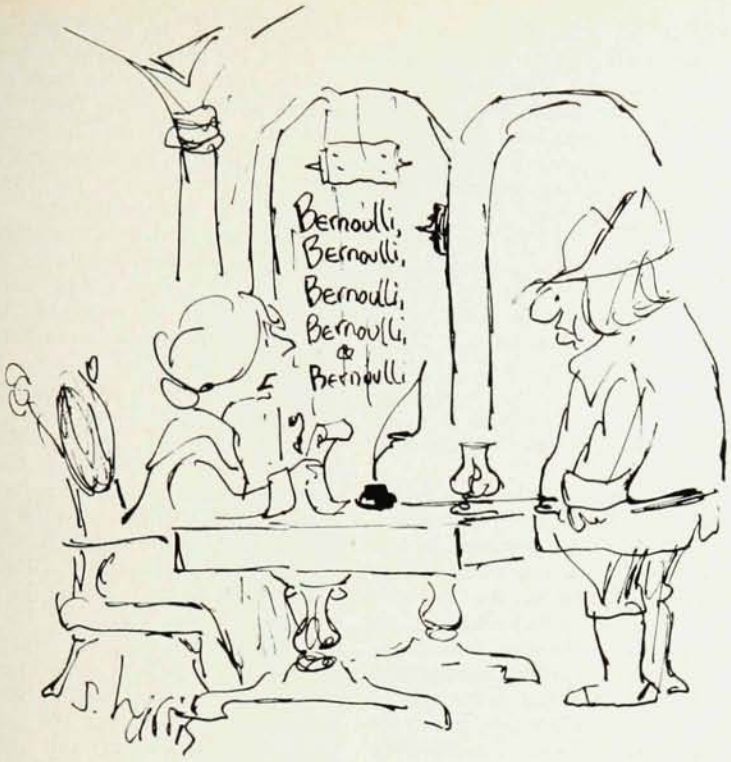

"WHICH BERNOULLI DO YOU WISH TO SEE— 'HYDRODYNAMICS' BERNOULLI, 'CALCULUS' BERNOULLI, 'GEODESIC' BERNOULLI, 'LARGE NUMBERS' BERNOULLI OR 'PROBABILITY' BERNOULLI?"

"tumors," professors are pygmies standing "with crooked little legs" on giants' shoulders, preparing lessons for pygmylets, social scientists are charlatans and the "College of Liberal Arts," wherever and whatever it may be, is a fraud. Perhaps the intent is that many negatives should make a positive, but I fear they merely subtract from the authority of the historical essays on 18th-century mechanics that are the heart of the book. Even there, though, I found myself recalling Truesdell's earlier historical works, such as the *Essays on the History of Mechanics* (Springer-Verlag, New York, 1968) and the *Rational Mechanics of Flexible or Elastic Bodies, 1638–1788* (Introduction to *Leonhardi Euleri Opera Omnia*, II.11_2, Füssli, Zurich, 1960), in which his wide reading and mathematical acumen produced the kind of critical history that most historians of science cannot write. From the new book's excellent essays on Newton, the Bernoullis, Euler, Jean d'Alembert and the unhappy John James Waterston one learns what happened, but not as much as one would like of how it happened.

It is unpardonable for a reviewer to criticize an author for not having produced a different book, but in this one I would have preferred more claw marks and less vocalization.

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Molecular Semiconductors: Photoelectrical Properties and Solar Cells

Jacques Simon and Jean-Jacques André
288 pp. Springer-Verlag, New York, 1985. $59.00

For some 30 years chemists have been attempting to design organic molecular materials for various applications, such as metals, superconductors and semiconductors, by exploiting the wide range of possible modifications in composition and structure of organic compounds. A prime motivation for this activity is that the organic versions should be cheaper than the inorganic. In this book Jacques Simon and Jean-Jacques André focus on the quest for a molecular semiconductor, a material with a gap of 1–2 electron volts, reasonable mobility (larger than 1 cm^2/volt sec) for charge carriers and the possibility for forming good p–n junctions. They have in mind photovoltaic

applications, specifically solar cells.

The photovoltaic effect in molecular semiconductors was first detected a little before 1950. Since then a great deal of work has been done on molecular solar cells, mostly Schottky-type devices. Typically the conversion efficiency has been less than 10^{-2}%. The discovery in the late 1970s of a conversion efficiency for white light of about 1% for a merocyanine solar cell stimulated interest in this field. Despite all the work, as the authors detail, there still is little understanding of the physics and chemistry going on at the junctions, of the huge effects of exposure to air or even of how the current is carried.

In the effort to make the book useful to chemists as well as to physicists—both groups must be involved in the effort to tailor molecular materials to particular applications—the authors provide an introductory chapter on some of the requisite solid-state physics. The chapter includes discussions of electrical conduction, in terms both of band motion and of hopping and trapping processes. A second introductory chapter covers the various effects of light on molecular semiconductors, including a discussion of energy-migration mechanisms and the photogeneration of charge carriers. This chapter includes also the theory of p–n and Schottky junctions.

Acknowledging the impossibility of describing all the molecular semiconductors on which work has been done, the authors wisely devote one major section of the book to the detailed description of a group of "typical" molecular crystals, the metallophthalocyanines, and another major section to a "typical" polymer, polyacetylene. In each case they cover chemistry and physics in detail. They begin with the presentation of synthesis methods, describe the resulting structure and morphology, consider stability and effects of impurities, and go on to discuss light absorption, dark conduction, the photovoltaic effect and solar cells. In the case of polyacetylene they include also a discussion of band structure, soliton theory and the semiconductor–metal transition.

In the attempt to write for both physicists and chemists the authors have, as they admit, sacrificed rigor in the hope of providing a more intuitive understanding for the chemist. An example of this is their discussion of conductivity in the first chapter, where they ascribe scattering of band electrons in a metal to the cations. This unfortunate view is ultimately corrected on page 108, where they discuss phonons in more detail, distinguishing among acoustic, optical and internal modes and their effects on conductivity. But overall, although much of the description of the basic processes is sketchy, the correct flavor is conveyed and the authors do give a large number of references—a useful feature of the book. It is unfortunate, however, that the cutoff date on the references is mid-1982; the discussion of polyacetylene, for example, suffers thereby.

Simon and André conclude that the ideal molecular semiconductor, as they have defined it, does not yet exist. As far as solar cells are concerned, the 1% efficiency of the merocyanine Schottky-barrier device is far inferior to the efficiency reported for single-crystal silicon solar cells (about 20%). However, in view of the possibility of covering large areas, and doing so cheaply, with a molecular material, it is clear that economics would tip the scale in favor of the molecular material at efficiencies well below 20%. This book should be quite useful for people engaged in the quest for the ideal molecular semiconductor, whether it results in a practical molecular solar cell or in material useful for other applications. Whatever the practical outcome, molecular crystals and polymers will be a source of interesting new physics and chemistry for many years to come.

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Medical Physics, Volume III: Synapse, Neuron, Brain

Arthur C. Damask and Charles E. Swenberg

337 pp. Academic, New York, 1984. $69.00

This book is the third and final volume of a series. The first volume, published in 1978, is subtitled *Physiological Physics, External Probes.* Volume II was published in 1981 and is subtitled *External Senses.*

The stated purpose of the series is threefold:

- to assemble a body of knowledge concerning the use of physics in medicine, as well as in physiology and biology
- to treat all topics at a common level, one that assumes that the reader has had one year each of physics and calculus
- to address those scientists and engineers who know very little of physiological processes.

Biochemical aspects are omitted except when they are related to a physical measurement. The books use primarily cgs units because the original papers referenced in the book are in those units. The authors "feel it will be easier to use as a reference book." However, the short (five-page) index is not very helpful. For example, neither "cortex" nor "event-related potential" is in the index.